

Parsons (Usher)

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DECOMPOSITION
AS A
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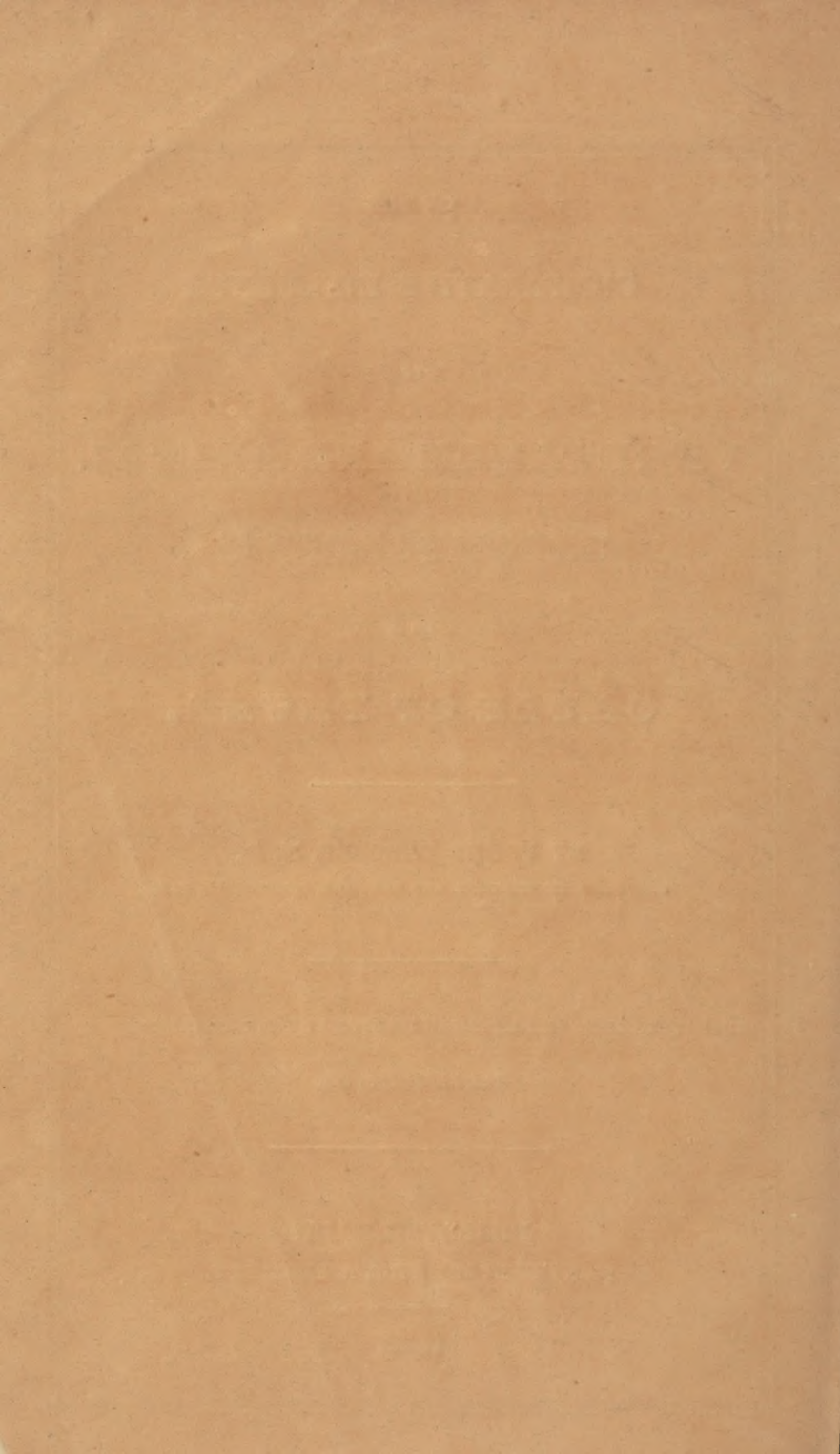
BY USHER PARSONS, M. D.
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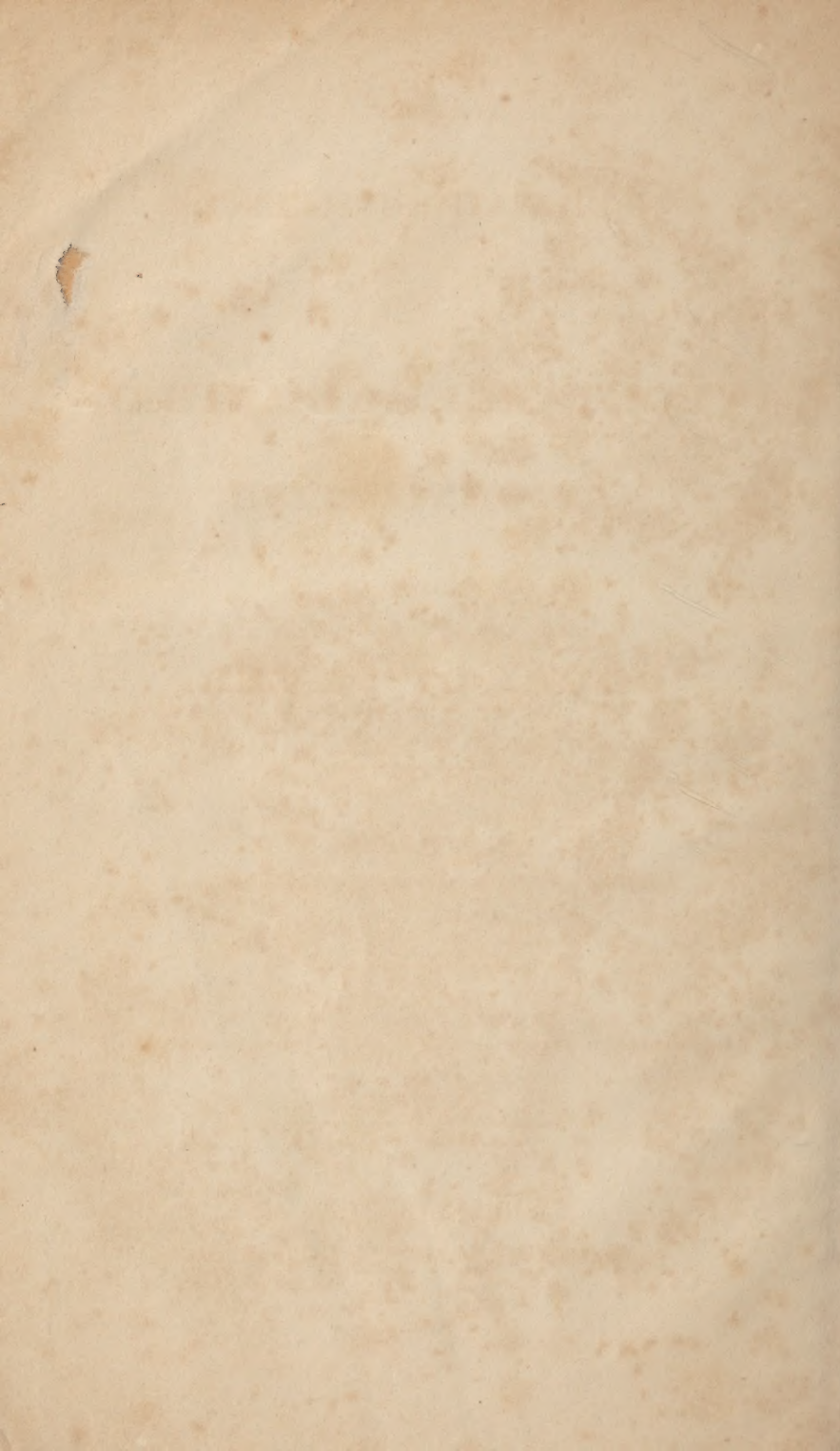
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IT is supposed, that one-sixth of the human species die of fever. As a majority of cases have seemed attributable to natural causes, unremitting attention has been given to their investigation. But notwithstanding the importance of the subject, and the weight of talent that has been employed, it involves important questions, that still remain undecided; among the most important of which, are those we have selected as the subject of the present communication.

In discussing these questions, our attention will be directed *first*, to the effect of vegetable decomposition; *secondly*, to that of animal decomposition; *thirdly*, to the comparative influence of both as a cause of fever.

I. *The effect of vegetable decomposition on the human body.*—The depopulation of particular regions—the destruction of armies quartered therein—and the greater prevalency of fevers at certain seasons, than at others, gave rise to a particular examination of the soil, face of the country, and atmosphere, peculiar to those places. It was soon ascertained that fevers prevailed most in marshy, moist ground, wherein vegetables having grown, die and putrefy. This led to the belief, at an early period, of their being caused by putrefaction, and this belief has become so generally and firmly established, that a statement of it at the present day wears the air of a truism. It may, however, not be amiss, on the present occasion, to re-examine the evidence on which such belief has been maintained.

1st. Is fever proportioned in frequency and intensity, to the amount and rapidity of vegetable decomposition? The rapidity of this process is regulated by the degree of heat and moisture. Either of these agents, without the other, fails of producing it. If moisture be increased till it excludes air from the surface of vegetable matter, decomposition is suspended, and the same effect is produced, if heat

be increased till moisture is dissipated; as also when the surrounding atmosphere is reduced to the freezing point. But when the temperature of this ascends from 32° Fahrenheit, the proper quantity of moisture being present, decomposition increases in direct ratio with it, till the degree of heat rises to 100°. Let us now inquire whether the frequency and intensity of fever prevails in countries where decomposing vegetables abound in proportion to the degree of heat and moisture.

In respect to heat, we may observe that the ancients discovered at an early period, that its prevalence coincided with that of fever. To this agency alone, they attributed the malignant fevers that wasted their armies, and depopulated many regions. They observed too, that frost arrests, or mitigates all fevers, which they had ascribed to the influence of this cause;—that it stayed the progress of intermittent, bilious, remittent, and yellow fevers;—that such fevers were unknown in the winter season of temperate climates, and that they commenced only in the summer, and declined in autumn. Later writers have observed, that within the tropics, no season is exempted from the occasional appearance of these fevers, and that in some parts, they prevail through the year;—that winds from the north even in summer, render them milder in all places; that even the shade of trees moderates their violence, while this, on the other hand is greatly augmented, when the trees are cut away, and the surface of the ground left exposed to the direct influence of the sun. Hence, the first settlers of a wilderness suffer less from fever, than those do who arrive immediately after forests are cleared, and before decaying substances are removed from the ground by cultivation. The severity and duration too, as well as the frequency of fever, is influenced by the degree of heat. This is observable both in respect to different seasons, and to different latitudes, and also to different altitudes of the same place. In some latitudes, vernal intermittents are succeeded as the season advances, by bilious remittents, corresponding in severity to the elevation of temperature; and when this is very high, and long-continued, they assume the malignant type. In the autumn again, they become milder, and are finally checked on the accession of frost. In respect to their duration, we find that in England, and in corresponding latitudes on the continent, fevers appear in August, and prevail through September, declining as the cold weather approaches. In the Netherlands, they appear in the latter end of July:—in the campagna of Italy, and in Spain, early in July: in Sardinia and Minorca in June, and are prolonged till late in November; in Egypt in May, and they prevail both earlier and later in Gambia nearer the equator.

The same remarks apply to this country, making allowance in comparisons with Europe, for difference of temperatures in corresponding latitudes. The fevers we have mentioned are hardly known in Quebec; are rare and mild in New England, excepting in extremely hot seasons, when they produce yellow fever: its exemption from intermittents and remittents being ascribable to other causes than an appropriate degree of heat, and which will be noticed hereafter. Passing southward we find the frequency and severity of fevers increasing in Maryland and Virginia, still more in South Carolina and Georgia, and appearing earlier and later till we reach New Orleans, where fever of a malignant character prevails during a great part of every summer.

In respect to difference of altitude, heat, in conjunction with other causes to be noticed, acts with more effect on the low grounds of tropical climates, than on elevated situations, where the temperature is cooler. Monks-hill in Augusta, says Dr. FERGUSON, is quite exempt from yellow fever at the height of six hundred feet. On the Ridge, a sloping hill in India, three hundred feet above the marshes, the yellow fever of the marshes disappears, and the common remittent takes its place, while at the top of the Ridge, five hundred feet high, the troops are exempt from disease.*

The same remark applies to the fevers of Cuba. "Tivoli, less unhealthy by far than Rome, is three hundred feet above Rome. Sezza, exempt from diseases, is nine hundred feet above the Pontine marshes."† It appears then, that in proportion to the degree and duration of heat, other causes concurring, is the severity and duration of fevers, until the temperature rises to 100°. "Putrefaction takes place most readily," says FORDYCE, "in a heat of 100° of Fahrenheit's thermometer. It goes on much more slowly in a heat of 110°; it goes on more slowly in *less* degrees of heat than 100; and scarcely at all at 40°."

In respect to moisture, it may be observed, that when this is wanting fever rarely occurs; and when it is entirely dissipated, fevers that have prevailed disappear. It has a most important influence in modifying the influence of heat. In some dry situations, the hottest seasons are the healthiest. LIND states, that the hottest season of Senegal is the driest, and at the same time the healthiest. The inhabitants near the hot deserts of Africa, are invariably free from epidemic fevers. "In the hot countries within the tropics, in general, the hot and dry season is healthy." Lind, speaking of Guinea, says, this, as most tropical countries, has, properly speaking, only two

* American Quarterly Review, Vol. IV. p. 296.

† Ibid.

seasons, the wet and the dry. The former is of about four months continuance, and is the season of sickness; whereas, for many months in the dry season, most parts of this country are equally healthy and pleasant with any in the world. No sooner, however, do the rains set in, than the ravages of disease commence, and continue throughout the wet season, and afterwards, till the attendant moisture is evaporated. As soon as this is effected, the health of the country is restored, except in those places which continue wet throughout the year. The same thing occurs in this country. Wet seasons, if hot, being generally more sickly than dry ones. The wet seasons of 1804, 1821, and 1823, were very sickly, and the dry one of 1822 was comparatively quite healthy. If there be exceptions, if dry seasons produce local epidemics, they are uniformly in marshy places, or in artificial ponds, where evaporation exposes decaying vegetables that were previously inundated. Hence it is that there are some, who, even in the present advanced age of medical science, believe that moisture alone will produce intermittent, remittent, or bilious fever.

But let such inquire of those who sail on the great lakes of this country, particularly Erie, and they will find that vessels anchoring in the months of July and August on those parts of its shores that are marshy, have their crews affected either with intermittent or remittent fever, according to the advancement of the season, and that new cases cease immediately to appear, on sailing from such anchorage to the central part of the lake, or to a port having a bold shore, or which is destitute of decaying vegetables. In sailing from this lake during midsummer to lake Michigan, crews are apt to suffer more or less with fever from passing through the river St. Clair, especially if detained by head winds, and the inhabitants of both its shores have suffered from fever and ague more than almost any other section of country, yet, on entering Lake Huron, new cases of fever in such crews immediately cease to appear.

From the sick records of the surgeon of the United States' squadron on Lake Erie, I have found that the ships anchored at Put-in-bay, with healthy crews, in the month of August, 1813, that while there, and at Sandusky Bay, a few miles from it, which was still more marshy, there occurred in the space of three weeks more than one hundred cases of bilious remittent fever, and forty of them in the flag-ship, her crew consisting of one hundred and thirty men—that on sailing in this time upon a short cruize across the lake to Malden, the fever was entirely stayed, but that new cases began to appear immediately on returning to their former anchorage, and that after the 10th of September, the day they sailed some ten or twelve miles to meet the enemy, no new cases occurred. In these lakes there is

no salt to correct the febrific quality of the moisture in ships, and yet they are healthy when in the centre of the lake, whilst persons have, within my knowledge, caught intermittents and remittents by passing in a steam-boat in a clear night through the *marshes* between New York and New Brunswick, although the water all the way is salt.

But, while we deny that moisture is the sole cause of such fevers, we repeat that it is necessary for the progress of putrefaction, and consequently for the generation of fever. If there are apparent exceptions, if some places that appear arid are nevertheless sickly, it will be found that they are remarkable for having dews at night which act like rain on decomposing vegetables.

“This accounts for the fevers produced in the arid tracts near Lisbon, mentioned by Dr. Ferguson, remarkable for their dryness. Moisture may also flow below the surface when this appears parched. On many of the water-courses which run between the ridges of the hills in Sicily, the streams often disappear below the gravel, and pass to the sea, near which, water is found about a foot below ground. These hidden streams produce decomposition of vegetables and also fevers.”*

But if, on the one hand, a total dissipation of moisture will arrest the progress of vegetable decomposition, and at the same time of fevers, so on the other hand the same effects will be produced by its superabundance. Thus, a bilious fever was arrested in Brabant, by inundating a marsh in its neighbourhood, and Sir JOHN PRINGLE relates, that the inhabitants of Breda adopted the same expedient with success. The marshes of Delaware are innoxious in seasons when they are completely overflowed. “The same is said by DAZILLE, of the marshes of Cayenne.” Excessive rains have produced the same effect in many places in this country. In short, whenever moisture is sufficient to exclude air, the process of decomposition as before stated, is suspended, and with it also the prevailing fevers we have mentioned. It is only then, where heat and moisture are duly proportioned, that fevers are produced, and these will be severe in proportion to the combined activity of these agents, a sufficient quantity of dead vegetables being present for them to act upon.

A sufficient quantity of vegetables we repeat, for this is as important to the morbid result, as the agency of heat and moisture.

* The same thing was observed in Dutch Brabant by Sir John Pringle. Where the soil is light, and penetrated by water every where beneath the surface, and in summer loads the air with vapour, even where no water is visible. The people are more or less subject to intermittent fevers, in proportion to the comparative distance of the water from the surface, so that by looking into the wells, one may form a judgment of the healthfulness of the several villages.—*Observations on Diseases of the Army, p. 2.*

Whenever this is most abundant, heat and moisture acting in due proportions, there fevers will be most prevalent, their intensity or malignancy increasing according as the heat approaches the degree of 100° of Fahrenheit. Salt marshes have been supposed to form an exception, but this is a mistake. "They produce fever in Normandy, and on the French shores of the Mediterranean, in Spain, and throughout the south of Europe." In Holland, the severest seasons of fever have succeeded irruptions of the sea. The same thing is observable on our own sea-coast, and several writers have observed, that putrefaction is more rapid whenever salt and fresh water intermix upon vegetables, and that salt marshes situated at the confluence of fresh and salt water, are more pernicious to health, than marshes surrounded by fresh water—and the effluvia exhaling from them in hot weather, every one must acknowledge, is more offensive.

In tropical countries, sickness prevails most in low and marshy plains, as Benin, New and Old Calabar.*

"All those cities and stations in Africa, Asia, and America, which have been the grave of unnumbered thousands, are situated at the mouths, or on the banks of rivers, in flat countries, which in the rainy season, become one vast morass."†

In more temperate climates, similar spots are the seat of endemic fevers of a milder character. The artificial morasses, produced by building mill-dams, are the spots noted for disease—of this, every neighbourhood affords instances.‡ Where vegetation is rank, and forms a thicket of grass and reeds, and these become moistened and matted together, they form what is termed a jungle. This kind of materials is so fruitful a source of fever, that in many places it has given rise to the name of jungle fever. The swamps and shores of lakes, ponds, and rivers, when first cleared, present to the sun great quantities of underwood and jungle, which had before been excluded by dense foliage. "The dreadful fever, affecting the first settlers of the Genesee country, from 1796 to 1800, arose from their clearing and settling the rich bottom land."§ Doubtless, much of the salutary influence of the foliage of trees is ascribable to the changes produced upon the air by vegetable respiration. The ancients held their groves to be screens to their health, and "the unhealthiness of the Porta del Populo at Rome, arose from cutting down a wood that served as a screen to that part of the city." When cultivation of the soil has taken place for some time in the new countries, and vegetable matter is decomposed on the ground, and dried by ditching

* Lind.

‡ Cooke, Med. Record. Vol. VII. p. 451.

† Ibid.

§ Amer. Quar. Rev.

and draining, the inhabitants suffer less from fever—hence intermittents which, in their early settlement prevailed extensively in the western parts of Massachusetts and in Connecticut, on the rich bottom lands and *intervales*, have quite disappeared. But it is unnecessary to dwell longer on the well-known febrific tendency of marshes, and other moist places covered with dead vegetables in hot seasons. It is known not only to the profession, but even to the vulgar, and to the less enlightened nations—to the lower orders of Europe, to the negroes of Africa—and it is familiar to all the yeomanry of this country. Scarce an individual can be found in the profession, who doubts that intermittent, remittent, and yellow fevers, are proportioned in frequency and intensity to the amount and rapidity of vegetable decomposition.

This is, however, to be understood as referring to vegetables that are similar in kind. Different vegetables vary in their morbid effects, while undergoing decomposition. It is not produced at all by dead peaty bogs, or by peat which carries on no vegetation.* Blades of grass are less baneful than more succulent plants, as cabbage and the bulbous roots, potatoes, turnips, &c. Large wood decays more slowly in successive concentric layers, and generates miasin slowly in proportion to its bulk, but “the poisonous effects of putrefying flax, hemp, indigo, and coffee, are well known in the storehouses on the wharves of New York and Philadelphia.” Perhaps this more deadly character may be owing to confinement and concentration, and to the fact that a sort of fermentative heat is generated in the centre of the mass.

If required to specify instances in this country, wherein fever proceeded from vegetable decomposition, we might name a great number that are recorded in the early medical journals of New York and Philadelphia. The Medical Repository was commenced early after the prevalence of yellow fever in Philadelphia, and other seaports, and received the reports of physicians respecting it, from every quarter. The five first volumes contain a large number of instances, where yellow and malignant fever was decidedly and unequivocally referable to vegetable decomposition. In some instances, fever was traced to damaged coffee, in others, to vegetable filth in docks, in others,

* “In the campagna of Rome, it is remarked, that if the labourers cut down certain plants, (a bushy thistle chiefly, of which the botanical character has escaped me,) a fever that otherwise would not have occurred, is the consequence. The malaria seems, or is thought to be entangled within it, and to be let loose by this disturbance.”—*Macculloch*.

to marshy ground, and some sporadic cases occurred in houses whose cellars contained rotten cabbages, potatoes, and turnips. The prize dissertation of Dr. COOKE, in the Medical Recorder for 1824, furnishes more histories than any other publication, of the remittent and intermittent kind of epidemic fevers in the middle and southern states, ascribable to no other cause than the foregoing.

“And indeed so intimate and obvious is the connexion between such cause and effect in a vast majority of cases, that wherever fevers of the last mentioned character appear, we are warranted in ascribing them to such causes, even where its existence is not manifest.”*

The febrific cause may arise from stagnant pools, from the banks of rivulets and fish-ponds in the neighbourhood that were never suspected of it, or it may be brought from a distance by unknown currents in the air, and affect the residents of an apparently healthy situation. It may do this too, when persons residing nearer the source, but in places of different altitude shall escape its baneful influence. “Sometimes a house on the very bank of an unhealthy river will be comparatively healthy, while places, even high grounds, at a distance, will be affected, manifestly because it (malaria) is transported thither by breezes or currents of air.” Dr. MACCULLOCK, in his invaluable work, cites numerous cases in proof of this position.

Generally, however, the baneful product of vegetable decomposition, if undisturbed by breezes and currents, hovers around its source in the lower stratum of the atmosphere, and in the same temperature of it ascends only to a certain height, leaving the other strata comparatively free; hence the upper stories of houses near it are, with few exceptions, depending on vertical currents, far more healthy than the ground floors. When the air is heated by artificial fires, or by the sun, the poisonous exhalations are rarefied, diluted, or dispersed, and are less morbid; but on the approach of evening dew, they are condensed, and as it were, precipitated nearer the earth, where meeting new exhalations, they are concentrated and more baneful in their effects.† Hence, the beginning of the evening causes more cases of fever than midnight, when the poisonous exhalation is completely condensed upon the soil, and this last more than mid-day when it is rarefied and diluted and dispersed by heat.‡

In respect to the distance to which malaria may be conveyed horizontally, by currents of air and wind, various opinions have prevail-

* Macculloch.

† Lind.

‡ The Italians say, that however deleterious the evening air may be, the night air after 10 o'clock is not so.—*American Quarterly Review*, Vol. IV.

ed, some having limited it about the spot where it emanated, while others think it may be transported many leagues. BLANE presumes that the malaria never reaches beyond three or four hundred yards in a horizontal direction, provided it be calm. Macculloch thinks that the intermittents of the west of England and Scotland are caused "by malaria transported from Holland, or the shores to the northward of it by fog and east winds." There are numerous records of ships that make the distance which malaria has come and affected their crews from two to six miles. But the maximum distance is not yet satisfactorily ascertained.

But what is the substance exhaled that bears so much disease on its wings? "Perhaps the best and the truest account of its nature would be," says Dr. Macculloch, "an acknowledgment of utter ignorance." Miasma or miasm is its common name, and those who maintain that morbid exhalations proceed from animal as well as vegetable substances, distinguish this by the term marsh miasma. "In Italy, the locality of such putrefying vegetables go by the name of maremmes, and the infectious matter there generated, when mixed with the atmosphere, is malaria, bad air." It was the ancient opinion that the deleterious quality of the air impregnated with it, is owing to animalculæ, which invade the body through the lungs, sometimes perhaps through the stomach, and even through the skin. "This is a speculation," says Dr. Macculloch, "that dates as high as LUCRETIVS, VARRO, and COLUMELLA, which seems to have been revived in the days of the microscope, by KERCHER, and some others, and appears naturally enough to have found favour with Linnæus." A learned reviewer of Macculloch at the south, has adopted this opinion, and maintained it with many plausible and ingenious arguments, which but for their lengthening this paper beyond reasonable bounds, I would gladly insert.*

It was attempted by many learned chemists to discover the poison among the ascertained chemical gases, and it was referred successively to carbonic acid, azote, hydro-carburetted, hydro-phosphuretted, and hydro-sulphuretted gas, and even ammonia, and also to a yet undiscovered compound of azote and oxygen, called septon. But as these gases can be applied to the human body in a more concentrated degree in the laboratory without producing fever, it was attempted by means of analysis which modern chemistry furnishes, to examine the air produced by marshes, and to inquire whether it did not really contain some peculiar volatile substance or compound, an *un-*

* See American Quarterly Review, Vol. IV. p. 286.

known gas, the true source of the evil. The eudiometrical experiments of GOTTONI and MOSCHATI, produced no results, as might have been anticipated. Nor is malaria cognisable by the senses. It is supposed by common observers to be the same as the effluvia arising from marshes, which makes so strong an impression upon the olfactories in the twilight of evening. But although often, and perhaps generally, combined with such effluvia, yet "we do know," says Dr. MACCULLOCH, (p. 50,) "from ample experience, that malaria occurs in abundance where there is no smell."*

How does malaria, (for such I shall call febrific exhalations,) find its way into the system? Some have supposed that it is admitted by every accessible surface. Others have contended that it affects the system through the stomach; and others, that it acts on the nervous system through the olfactories;† others, that it is absorbed by the skin;‡ and a still greater number that it is inhaled by the lungs into the circulation. There is no positive evidence, however, to establish any one of these theories. The suggestion that the stomach was the channel, arose from the fact, that when malaria produces malignant yellow fever, it affects the stomach, producing vomiting of mæœna; hence many physicians have advised persons who are exposed to malaria, to chew substances, and not swallow their saliva. Among these was the late Dr. MILLER of New York, who afterwards entertained the belief that the lungs are the chief if not the only channels of admission. It can hardly be supposed that the saliva, if impregnated with malaria, could blend with the food in the stomach, while undergoing the process of digestion, and retain any putrid quality, since it is the nature of the gastric juice to correct putrefaction, and as to the strong bearing of yellow fever upon the stomach, we know from the experiments of GASPARD, MAGENDIE, and others, that water impregnated with putrid vegetable substances injected into the veins will produce the same gastric inflammation, the same vomiting of mæœna as appears in yellow fever, which shows that the stomach is not the necessary, and probably from its antiseptic power, is in fact not the real organ of entrance. That the lungs and skin are the entrances is the more general belief, and is supported by better evidence. It was ascertained by BICHAT that fetor from putrid animal matter gained admittance through the skin. Having discovered that the flatus from his bowels acquired the smell of the air of his dissecting room, he respired for some hours through a tube which led into the open air, while he remained in a room containing highly putrid

* See also p. 73 and 75.

† Rousseau.

‡ Brochi.

matter. The same effect was produced on the flatus, as when he respired the air of the room, and the same effect was produced by respiring the air of *the room* through a tube while he remained some hours in a pure atmosphere. These are offered as analogical proofs only, and even as such they are very imperfect, for the odour itself, as we have before observed, is not the malaria or febrific principle, and it is here an animal, not a vegetable fœtor, that Bichat absorbed into his circulation from the lungs and skin.

What are the diseases produced by malaria?—This subject has received the particular attention of Dr. Macculloch, in his invaluable work on malaria. Few people in this country are aware of the multiplied and varied forms of disease generated by this noxious principle. It is believed by this author, and admitted by some others, who possess the best means of information, that nearly half the diseases which visit the human race proceed from this cause. Dr. Macculloch enumerates the following—intermittent and remittent, both simple and malignant, and nervous fever; dysentery and cholera; dropsy, œdema, obstructions of the liver and spleen; neuralgia, and particularly that form of the tic douloureux, to which he would perhaps add, (Dr. Cooper thinks,) the Dengue of Charleston and Havana. He is in some doubt as to scrofula and goitre, hebetude of intellect and general lassitude, rickets, hernia, rheumatism, sciatica, tooth-ache, asthma, peripneumony, dyspepsia, palsy, phthisis, and chlorosis. But most of these are certainly produced by other causes, and some of them are probably not entitled to a place in the list. The subject proposed for this dissertation embraces only fever, and under this head may be ranged as the offspring of malaria, the various kinds of intermittent, remittent, yellow fever, and a great proportion of the autumnal continued fevers of New England, whether inflammatory or typhoid. The yellow fever, as we shall attempt to show, may proceed from other causes than vegetable decomposition, as also typhus gravior or putrid fever, whilst typhus mitior is oftentimes the consequence of fatigue and other debilitating causes. A minute examination of the localities of this last disease in New England, will discover it to be more endemic around factories, and on the shores of our rivers that have been dammed, and produced marshes, than elsewhere.

To the above list may probably be added some cases of dysenteric fever and cholera morbus. This list of fevers bring in their train many chronic affections, such as visceral complaints, that may partake more or less of the nature of fever.

There is much reason to believe that epidemic pneumonia, as it prevailed in the winter of 1812 and 13, in the army and navy on the frontiers, originated in the malaria of that section of country, imbibed into the system during the summer and autumn. The soldiers and sailors arrived on the lines at Sacket's Harbour, Buffalo, and along the shores of Lake Erie, late in the summer, and in the beginning of autumn, and were encamped in places where the inhabitants had suffered much with intermittent and remittent fevers. The accession of cold arrested the progress of vegetable decomposition, and of course the amount of malaria, whilst at the same time it so far braced the system of these men as to lessen the tendency to develop the train of symptoms that constitute a regular intermittent or remittent fever, though it produced a strong predisposition to them. This predisposition continued latent in the system, till roused into action by exciting causes, the principal of which was great and sudden exposures to cold, to which these men were subjected.* Nor does this opinion concerning the cause of such an epidemic stand alone.

Dr. HUGH WILLIAMSON, speaking of the intermittents of North Carolina,† says—

“They disappear as the cold weather sets in, but they are frequently succeeded by fevers of a different type, that are more fatal. Those fevers of the colder season are commonly attended by partial inflammation, whence they are denominated pleurisies of the *eye*, or of the *head*, at other times they affect the *side*. In those several forms they are equally dangerous. *** It appears *chiefly*, perhaps *only*, in those places where people are subject to intermittent fevers, in low sunken grounds, and along the banks of rivers.”

Another paper, by Dr. G. PILLSON,‡ gives the same views. After speaking of the prevalency of bilious fevers in the summer, he adds,

* The well known tendency of organs below the diaphragm to take on diseased action in the summer season, and to suffer from malaria in the form of cholera, dysentery, and black vomit, is not greater than the tendency of those above the diaphragm to participate strongly and intimately in fevers of the winter season in the form of catarrhs and pleurisies and pneumonias, and this tendency gave a pneumonic character to the fevers in question, caused by malaria during the first autumnal months, (and which lurked in the system till the extreme cold acted as an exciting cause in developing them, and in giving them a determination to the lungs,) and acquired for them the name and character of peripneumony. The typhoid symptoms attending the disease in most places, which caused many observers to name it typhoid-peripneumony, tend to distinguish this from the common pneumonia of New England, and to refer it to the causes we have mentioned.

† Med. Repos. Vol. II. p. 156.

‡ Med. Repos. Vol. V. p. 137.

“that in February, March and April, a fever proved very mortal in town and country. Some physicians called it bilious peripneumony.” There is some ground therefore for the opinion I have advanced, that epidemic pneumonia, when it succeeds to a sickly season in malaria districts, may be classed among the above fevers, which are more unequivocally ascribable to vegetable decomposition.

II. *The Effect of Animal Decomposition upon the Human Body.*—If medical men have generally agreed in opinion respecting the febrile nature of exhalations from decomposing vegetables, it is far otherwise in respect to those emanating from animal substances. There are probably at this time a majority of the best informed part of the profession who regard animal decomposition as innoxious in its effects, or at any rate as not productive of fever of any kind; and this opinion is now prevailing with the profession both in Europe and America. This is owing in no small degree to the distinguished rank and talents of several individuals who imbibed the opinion, and maintained it publicly, and with great zeal and ability, in works on fever, and in many of the periodicals of the present day. At the head of these may be named Dr. BANCROFT, who, though not the first in declaring that animal putrefaction has no febrile qualities, has taken more pains to establish such a belief than any other individual. The other gentlemen I shall mention, are two distinguished professors, viz. Drs. CHAPMAN and WARREN of Philadelphia and Boston, who, to the many facts adduced by Bancroft as proofs of this doctrine, have added several corresponding ones from their own observation. The public teachers of medicine in our medical schools have likewise, in most instances, supported the same opinions. Such distinguished leaders in support of any doctrine, will naturally draw numerous advocates into their ranks, and hence we find the opinions of these gentlemen pervading the profession generally.

In the early ages of medicine, the opinions respecting the febrile nature of decomposing substances, was the reverse of what we have stated it to be at present. Identifying the morbid character of putrescent substances with their sensible odour, they regarded their pernicious effects upon the constitution as proportioned to their offensiveness to the olfactories. “The Egyptians, Jews, Greeks, and Romans, were careful to dispose of their dead by burning, or by burying them far without the walls of their cities;” and their armies were cautioned against encamping long near a field of battle, lest the putrefying bodies of the slain should generate pestilential diseases. The same belief continues to prevail even in modern Europe. In France and Italy edicts were issued from time to time, by both se-

cular and ecclesiastical authorities, from the eighth to the eighteenth century, against interments in churches and cities—and it is probable, that but for the writings of Dr. Bancroft and others, the same belief would have continued to this time. As the subject is interesting to health and life, it is time that the opinions of Dr. Bancroft and his disciples, as well as the facts on which they are grounded, should be carefully examined, and collated with other facts that will tend either to confirm or refute them. The question proposed for this essay presents an opportunity for doing this, and with the deference due to the elevated rank and distinguished talents of the gentlemen we have alluded to, a feeble attempt is here made to canvass the evidence on both sides of the question.

The reasons urged in support of the innoxious, or non-febrile nature of animal decomposition, are *first*, That the number of instances wherein fever has been actually ascribed to such a cause, by those who believe in its power to produce it, is very small, and the cases are not well attested. *Second*, That when the cause has existed in greatest abundance, and was therefore most likely to produce fever, this has not occurred.

Let us now inquire what are the kinds of fever that have been attributed to this cause? Taking the nosological arrangement of Dr. Good, we may arrange idiopathic fevers under the following heads:—1st. Intermittent. 2d. Bilious remittent, simple and malignant; the last of which includes yellow fever. 3d. Hectic common inflammatory fever. 4th. Typhus gravior. 5th. Typhus mitior. 6th. Synochus. From this list we are justified by the nature of their known causes, by the local circumstances of places where they occur, as well as by their general character, in dropping all except yellow fever and typhus gravior. Most, if not all practitioners, will concur in the opinion, that the other kinds have rarely, if ever been attributed to animal decomposition. Alibert remarks, that intense application to dissections has in some instances caused malignant intermittents in Paris. But I have witnessed no such effect there, nor elsewhere, whilst many physicians of the first respectability, who have passed years in such employments, deny that such fever has, in any instance within their knowledge, been ascribable to such a cause.

The two fevers just mentioned have been variously named—typhus gravior being termed the hospital, jail, or ship fever, and by some malignant typhus or putrid fever; the other has been called typhus icterodes—malignant bilious remittent, but more commonly yellow fever. Those who believe that vegetable decomposition alone pro-

duces fever, (leaving contagionists out of the question,) ascribe both kinds to this cause alone, and those who believe in the febrific qualities of animal as well as vegetable decomposition, attribute yellow and putrid fevers to each of these agents, or to both combined, under the name of *vegeto-animal putrefaction*.

To the above causes of these two fevers may be added that of contagion, which is strenuously maintained by some as the most frequent cause, and is as warmly opposed by others. But as the question of contagion is foreign to our present investigation, and would require a volume to support or refute it, we here take leave of it, and return to the question. *If yellow and putrid fever can be produced by animal decomposition, why are there not more and better attested cases to prove it?*

In answering this question, we are to keep in mind the circumstances, which we have already considered, which tend to give efficacy to vegetable decomposition as a cause of these fevers—they are intense heat, moisture, and abundance of decomposing materials. Now, a careful examination of the two cases will show that these three circumstances occur often, in respect to vegetable matter, and but very rarely in respect to animal matter.

In the first place, in respect to heat and moisture, animal matter is rarely found like vegetables in suitable relation to them. It is not abundant like vegetables upon marshes, where the sun can act upon a broadly extended surface of it, and that too while in a constantly moist state. When exposed to the degree of heat that will elicit the cause of such fevers from vegetables, animal matter soon parts with its own moisture by evaporation, and becomes perfectly dried. The jerked beef prepared for commerce under the tropical sun of South America is a proof of this fact. Every anatomist knows that his preparations can be preserved in midsummer if hung in a draught of air. The human bodies preserved for centuries in the cemetery near Palermo, were secured from putrefaction by heat, as are the bodies of those who fall in the deserts of Africa.

Where, however, a carcass is not placed under such favourable circumstances for desiccation, we know that it can exist in a putrid state but for a comparatively short space of time. The law imposed upon animals, “eat or be eaten,” is imperative, and we know, without referring to scripture, that “where the carcass is, there will the eagles be gathered together.” Carnivorous animals, large or small, are always at hand to consume every species of carrion.

One of the signs of approaching malignant fevers, is increasing swarms of flies, and of other insects, which, whether they have just

sprung from putrid matter that has escaped human observation, which is to generate the disease, or are provided for the purpose of removing such matter, we know that they are present to consume putrid animal matter.

Add to this, that in all populous places where such fevers spread, the police is always peculiarly observing of dead animal substances. Guided chiefly by the impressions made upon their senses, the peculiar offensiveness of effluvia from putrid animal substances, as well as the loathsome sight of them, leads to greater precautionary measures. A dead cat in the street is removed and buried, whilst putrid vegetable matter remains collected around the walls of buildings, and putrid coffee is thrown into the docks. A dead rat concealed in a dwelling, will extremely annoy the inmates till every pains is taken for its removal, or will drive them to some other part of the dwelling that is less scented, whilst putrid potatoes, turnips, and cabbages in the cellar, of an hundred times the bulk, are often entirely disregarded. The crew of a ship in sickly ports in hot seasons, will, if left to their own inclination, sleep on deck, in an atmosphere loaded with morbid vegetable exhalations, whilst a single putrid rat, or even mouse, concealed in the cabin or fore-castle, would cause a thorough purification of the apartment. The shores of rivers and streamlets, bordered by marshes, are often visited in a summer's evening with delight and temporary refreshment, whilst the stench of a slaughter-house, in the neighbourhood of a city, though containing scarcely a visible portion of decomposing animal matter, is turned from with disgust. With such precautionary measures in the one case, and neglect of them in the other, because the senses are differently affected, can it any longer excite wonder that the fevers we have mentioned, supposing them producible by it, should so rarely proceed from animal decomposition, and yet so frequently from vegetable decomposition? Seeing too that the latter is so abundant about populous places, and requires only a long-continued heat, from 80 to 100°, to act upon it, whilst putrid animal matter is at such times, for the reasons we have mentioned, so rarely to be found.

Much has been said of the influence of city interments upon the public health, and those who hold to the innocuous nature of animal putrefaction, might refer me to burying grounds for sufficient quantities of decomposing bodies. It is not worth the time to examine the fine spun theories published by Dr. PASCALIS, to show that "the fetid gases in a grave can permeate the superincumbent earth, and exhibit phosphorescent light hovering over the spot, and impregnating the atmosphere with morbid principles." Sufficient for the pre-

sent discussion is the fact, that, when the yellow fever broke out in New York, from Coentis' slip,* and spread through the neighbourhood, its progress was immediately arrested by covering the putrid animal and vegetable materials from which it issued, with fresh earth. But because dead bodies when covered with earth, as in this case, and also as in graves, do not produce fever, are we to infer that such bodies would not produce fever if exposed to the open air?

But secondly. *When animal decomposition has existed in greatest abundance, it has failed to produce fever.*

Here we are met with the often-recited accounts of Bancroft, and others, respecting the mass of putrid animal matter exposed to the air in the exhumation at Paris and Dunkirk, and in dissecting rooms, and the putrid emanations from the burial ground at Seville. Let us examine them—first stating them in Dr. Bancroft's own words.

“Many writers of celebrity, and among them the great Lord Bacon,” says Dr. Bancroft, “have thought that no effluvia were so infectious and pernicious to mankind, as those which issue from putrefying *human* bodies; and it is still believed, that, in their milder state, they may cause putrid fevers, and in their more concentrated state, a true pestilence. There are facts, however, on a large scale, which completely decide this question;—two of these deserve particular notice. The first relates to the exhumation made in the church-yard of St. Elvi, at Dunkirk, in the year 1783: and the other to those made three years afterwards, in the church-yard of the Saint Innocens, at Paris. As the undertakings and results were similar in both instances, I shall, to avoid repetition, here describe only the latter, which I have preferred, because the corpses here taken up were much more numerous than at Dunkirk, and probably constituted the greatest mass of putrefying animal matter, of which we have any accurate information. The church-yard of the Saint Innocens, at Paris, situated in one of the most populous quarters of the city, had been made the depository of so many bodies, that, although its area enclosed more than one thousand seven hundred square toises, or near two acres, yet the soil had been raised by them eight or ten feet higher than the level of the adjoining streets; and upon the most moderate calculation, considerably more than six hundred thousand bodies had been buried in it, during the last six centuries, previous to which date, it was already a very ancient burial ground. Numerous complaints having been made concerning the offensive smells, which arose from this spot, and sometimes penetrated into the adjoining houses; and the public mind being greatly alarmed, it was at last determined to forbid all future burials there, and to reduce so much of the superstratum as would reduce the surface to the level of the streets. This work was undertaken in 1786, under the superintendence of M. Thouret, a physician of eminence in Paris, and in two years he accom-

* Medical Recorder, Vol. VII. p. 468.

plished the removal of that superstratum, almost the whole of which was impregnated, or *infected*, as M. Thouret styles it, with the remains of carcasses, and of quantities of filth and ordure, thrown upon it from the adjoining houses."

"The exhumations,' says this gentleman, (in the narrative of them, which he published in the *Journal de Physique* for 1791, page 253,) 'were principally executed during the winter, but a considerable part of them was also carried on during the *greatest heats* of summer."

"They were begun with every possible care, and with every known precaution; but they were afterwards continued, almost for the *whole* of the operations, without employing, it may be said, *any precaution whatever*; yet no danger manifested itself in the whole course of our labours—no accident occurred to disturb the public tranquillity.'"

The facts here recited from Bancroft to prove the innoxious nature of putrid animal matter, relating to the exhumations at Paris and Dunkirk, make a strong impression on the mind of one who merely glances at them. But a close examination of particulars will show, that if Dr. Bancroft has told the truth, he has not told the whole truth, but like a skilful advocate, rather than an impartial judge, he has suppressed important parts of the evidence, which if related, would prevent him from making out his case, and take away the support he intended to derive from them, to his favourite hypothesis.

In referring to these, and all other cases of animal decomposition, we are to bear in mind the circumstances we have already related of vegetable matter, as necessary to constitute it a cause of malignant, yellow, or putrid fever. And in the first place, in respect to heat. This it has been shown, must range above 60° of Fahrenheit for several days, in order to generate these fevers from vegetable decomposition. Now what was the temperature at the time the exhumations took place. "They were commenced at Paris in December, 1785, and continued till May, 1786—renewed again in the following December, and continued till February, and from the month of August 1787, to the month of October."* There were then only one or two months of the time in which malignant putrid, or yellow fevers, from even vegetable putrefaction, or any other cause are supposed to occur. "They took place in the night season only."† Johnson says "that miasm from marshes is expanded by heat, and that the evening air cools and condenses it. That it is the descending vapour of evening that precipitates with itself the miasm that had been elevated by heat, and hence twilight of evening is the time of

* Dictionnaire des Sciences Medicales, art Exhumation, Vol. XIV. p. 196.

† Ibid.

greatest danger," and that it is comparatively safe afterwards, is stated, as before observed, by the Italians. Now in the present case, there was no emanation in the day time, because the bodies were not uncovered till evening for removal, and then the cool air had no tendency to evolve and raise it from them.

2d. As to quantity of matter, "six hundred thousand bodies," says Bancroft, giving an impression that an immense number were exposed at one time, when in truth they were removed as fast as uncovered.

3d. To give credibility to the account of such numbers being buried, he is obliged to admit that they were six centuries work, yet not to lose by this concession of great length of time they had lain, he takes care to add in a note, that ninety thousand, (and this I admit is sufficient for his purpose as to numbers,) were buried within thirty years. But he is cautiously silent as to the time of the last interments, and also as to the time that animal matter is supposed to retain its febrile qualities. Now what is the fact in respect to these particulars. In respect to the duration of the morbid principle, in decomposing animal bodies, MARET,* an eminent French writer, states three years as the time for complete decomposition, when the grave is four feet deep, and four years when it is six or seven.†

What says Fourcroy? This gentleman, who was employed for chemical purposes in the exhumation of St. Innocens, states, "three years as a term during which the septic poison must take place."‡ Speaking of this very exhumation, he remarks, (p. 142,) "we had a strong desire to satisfy ourselves, by experiment, what was the nature of the destructive air, or 'septic explosion,' emitted from corrupting bodies, but we had no

* Dictionnaire des Sciences Medicales, Vol. XIV. p. 192.

† M. Burdach, in his Physiology, (Leipsic, 1810,) states that the decomposition of dead bodies takes place at three periods. *The first is that of fermentation*, which lasts many months; then there is a tumefaction of the body, from the development of gaseous substances which escape with an extreme fetor. In the second, which continues from two to three years, the soft parts are converted into a brown or green pulp; the mass lessens, because it is in a great part volatilized and converted into carbonated hydrogen, sulphur, phosphorus, carbonic acid, ammonia, and vapour. During the third epoch, the gaseous products completely escape, and there remains a dark-coloured earthy matter.

I might here add the generally received opinion of Dr. Fordyce, that putrid animal matter, put in contact with recently dead animal matter, hastens the process of decomposition, and there was enough of putrid matter at all times in this yard to do this, whenever a recent body was interred.

‡ Pascalis, p. 150.

opportunity, in consequence of there having been no burials there for three preceding years; the last deposit there being in 1782." Now the month of August 1787, was the time when "the bodies were removed in the hottest weather," as Bancroft relates it, which was five years after the last interment, and two years after morbid miasm, according to Maret and Fourcroy, had ceased to exist. Nor is it at all likely that the last interments, five years previous to said August, were specially reserved for this hot month, but most probably much older interments. There were, therefore, no bodies removed that were in a stage of decomposition favourable for producing febrile diseases, in *any* weather, however hot, even had the whole number been exposed to the air of mid-day at once.

But "the bodies," says the report, "were in every stage of decomposition." This expression is, however, to be understood as qualified by the time, that is, they were in every stage of decomposition after more than three years interment, in which time the septic emanation is completed. And should circumstances of soil or manner of interment prevent putrid fermentation from taking place within that time, it is probable that the deleterious emanations are decomposed, and recombined in new and harmless forms.

Another fact, particularly worthy of notice, which Bancroft unfairly or ignorantly omits to mention, is—

"The great number of torches and fires that lighted all parts of the cemetery and shed around a melancholy glare," and "the thick clouds of smoke that surrounded and covered the place of labour."*

Fires and smoke have been found of great utility, especially in military service, as was proved on a large scale by Buonaparte, before Mantua; and in Africa, the experiment in a small way has proved successful.

"Emigrants proceeding to Alabama and other southern regions, from the low countries of Carolina, find no injury from sleeping in the open air, as their custom at night is to build a large fire of logs, and lay themselves beside it, on some part of their baggage. The effect of fires in destroying malaria, is plain, if the fact of its existence depends upon the presence of moisture; for the moisture being evaporated by the heat, the poison is either dispersed with the vapour, or if separated from it, falls innocuous, and probably inert. It is on the same principle that smoking segars on the decks of ships is salutary. The heat and smoke keep a dry atmosphere about the uncovered face, and the air respired, being thus deprived of miasmata, is safe."

What then becomes of this formidable array of six hundred thousand bodies removed from the cemetery of St. Innocens, which occu-

* Dict. des Sciences Medicales, Vol. XIV. p. 187.

pies the front ground of the picture drawn up by Bancroft, and is copied verbatim in two of our public journals, in Boston and Philadelphia, by two of the first medical men in our country, and minutely repeated before classes, by almost every professor of theory and practice in our medical schools. 1st. They were removed as fast as they were uncovered. 2d. The exhumation took place at a season of the year when malignant fevers caused by malaria are known and believed by Bancroft not to exist, with the exception of two months, August and September, and in the night season too, when the degree of heat of *those* months is not sufficient to produce malaria. 3d. They were removed full two years after the time that an eminent chemist, who was present, states that they had ceased to be productive of morbid gas; and lastly, with such precautions and preservatives by fire and smoke, as would probably have disarmed the exhalations of their poison had there been any.

Another case of disinterment, quite as formidable, is given by Bancroft, which took place at Dunkirk in 1783, and which he declines relating, "because," he says, "the undertakings and results were similar in both instances, and he wished to avoid repetition." When did this take place? It was commenced on the 26th of February, and finished on the 16th of April,* a season in which no fevers from malaria, of either vegetable or animal origin are believed even by Bancroft to exist.

Now I appeal to the reader, I appeal to the candid part of the profession at large, whatever may be their opinion of the noxious or innoxious nature of animal decomposition, to decide if it was fair and candid in Dr. Bancroft, to shuffle the two reports of Paris and Dunkirk exhumations together, and turn up the face of one, and declare to the world that it is an exact representative of the other, when the most material point, the "*hottest weather*," is stated in the one case to have existed, and is italicised by him as a most material fact, and could not have existed in the other, the weather being cold, partly in winter.

Dr. Bancroft next goes on to say—

"If this result from taking up nearly twenty thousand bodies in different stages of putrefaction be insufficient alone for my purpose, there is another equally conclusive in its nature and extent.

"It is well known that M. Berthe, Professor in the School of Medicine at Montpellier, and two of his colleagues in that University, were sent by the government of France, into Spain, to examine and report upon the nature of yellow fever, which had proved so fatal in several towns of Andalusia, in 1800. M.

* Dict. des Sciences Medicales, article Exhumation, Vol. XIV. p. 196.

Berthe has published the report of the commission, of which he was a member, and in it has mentioned, that, being at Seville only a few months after the epidemic had ceased, he frequently visited the burying places just without the city, in which the victims of the fever had been interred; that in these excursions he was accompanied by the French consul at that city, and had occasion to converse much with the guards stationed at these places, and with the grave-diggers still employed in them, and he states, that besides these, many thousands of the inhabitants of Seville also came thither, some from curiosity, and others in processions, to testify their sorrow and respect for their departed friends. In one of these grounds, south-westward of the city, ten thousand bodies had been buried; in two others, seven or eight thousand; and in that of Triana about four thousand.

“‘The heats of the spring,’ says M. Berthe, (which I need not observe are considerable at Seville,) ‘were at this time beginning to be felt, and the ground of these burial places, being clayey, was already cracked into wide and deep crevices, through which a fetid odour was exhaled, the result of the decomposition which was going on among these heaps of bodies.’

“‘Filled with alarm at the calamities which might be produced by such masses of putrefaction, M. Berthe and his colleagues represented the supposed dangers to the Spanish government, and then went to Cadiz, where they found the churches more or less filled with putrid emanations from the same cause; but as they did not discover that these supposed fomites of infection were productive of any mischief, their fears concerning them seem at length to have subsided completely; for, in their reply to the president and members of the board of health, who had requested a statement of their opinions, they expressly declare their belief, that ‘if the yellow fever could be produced by the effluvia arising from putrefying bodies, it was evident that such a misfortune must already have taken place, through the imperfect manner in which the tombs and vaults, pointed out by them, had been closed, a defect which they had observed even in the churches most frequented.’ Thus it appears that the putrid emanations from the bodies of many thousand persons, who had recently died of the yellow fever, did not, and therefore could not produce that disorder.

“‘To the preceding facts I may add another, which is related by a man whose veracity is as little to be questioned as his exalted philanthropy—I mean John Howard, in his work on Lazarettos, page 25.

“‘The governor at the French hospital at Smyrna, told me, (says Mr. Howard,) that in the last dreadful plague there, his house was rendered almost intolerable by an offensive scent, especially if he opened any of those windows which looked toward the great burying ground, where numbers were left every day unburied, but that it had no effect on the health of himself or his family. An opulent merchant in this city, adds he, likewise told me that he and his family had felt the same inconvenience without any bad consequences.’

“‘If the exhalations from piles of bodies destroyed by the plague itself, and corrupting in the open air, were thus incapable of generating the contagion either of fever or of plague, even during the prevalence of a pestilential constitution of the atmosphere, (if any state of the atmosphere ever deserved that title,) it may, I think, be safely affirmed that there are no circumstances under which putrid animal matter can be supposed ever to produce febrile contagion.

"I have now before me a great number of similar facts, well authenticated, but those which I have just stated, will probably suffice to convince most of my readers, that if putrefying animal matters are not completely harmless, they are at least innocent of the charge of producing *contagious fevers*."

In respect to the mission of M. Berthe from France to Seville, Dr. Bancroft after giving the foregoing report, goes on to notice it thus. "The heats of the spring, says M. Berthe, (*which I need not observe are considerable at Seville,*) were at this time beginning to be felt, and the ground being clayey, was cracked into wide and deep crevices, through which a fetid odour was exhaled, the result of the decomposition which was going on among these heaps of bodies."

"*Thus it appears,*" says Mr. Bancroft, "*that the putrid emanations from the bodies of many thousand persons who had recently died of yellow fever, did not, and therefore could not produce that disorder.*" The italicised lines are supplied by Dr. Bancroft himself, and serve to show his readiness to bend and qualify evidence to suit his purpose. "*The greatest heats of spring,* says Berthe," and who, let me ask, will pretend that the thermometer ranges at Seville so high as 80° in the spring for a succession of days, or that the yellow fever ever prevails there till the summer is far advanced. Yet, apprehending that the word spring would imply a moderate temperature, he gratuitously supplied a qualification to make the heat greater in the mind of the reader than it actually was, and such as is requisite to produce malignant fevers from malaria, which, as we have before stated, ranges during the prevalence of yellow fever at 80° and upwards.

Yes! "*greatest heats of summer,*" which in the Paris exhumation Dr. B. thought of so much importance in his report that it made him italicise the words, but which in the Dunkirk case, that took place in cold weather, he thought of no consequence to distinguish it from that of Paris, yet here he would fain make the impression that "*greatest heats of summer,*" (or that degree which he elsewhere deems essential for the production of yellow fever,) occurred in the spring! And because these bodies "*did not produce yellow fever,*" at a season of the year when such fever never exists from any cause, the gentleman concludes forthwith, and positively declares that they "*could not produce that disorder*" at any season.

As to the report of Mr. Howard respecting the governor at the French Hospital at Smyrna, and of the fetor in his house, we may observe, that the febrile principle was probably in a great measure excluded by keeping the windows closed. Dwellings in the neighbourhood of slaughter-houses in Brooklyn, are affected in the same manner as is the highway. But the smell is not, I repeat it, the fe-

brific principle, nor is it to be understood as always proportioned to it. This story about Smyrna comes third-handed, and without any statement of the distance of the burying yard from the house, or of the temperature of the air.

In the appendix of Bancroft is a long account of the innoxious effects of dissections. But are these ever prosecuted in the heats of summer, when yellow fever prevails?

The account of an adipocire establishment near Bristol in England, is unaccompanied by any statement of the season of the year, or of the temperature of the atmosphere, or the number of persons employed or exposed to the effluvia, or of the amount of putrid animal matter existing at the same time. The same imperfection attends the accounts of the dead bodies washed on shore near Aboukir, the glue, soap, candle, catgut, and leather factories. I contend for no more in respect to heat, moisture, and abundance of materials, to give febrific activity to animal decomposition, than is already conceded by Bancroft and others to be indispensable for the production of yellow fever from vegetable decomposition. When, therefore, the above instances cited by Bancroft, to which many others have been added by the Boston, Philadelphia, and Baltimore writers, when I say, these instances are accompanied with evidence that heat and moisture concurred at the same time, and in the same degree, as is admitted to be necessary for the production of yellow fever from vegetable matter, then, and not till then, is any of this negative kind of evidence admissible against the febrific power of animal decomposition. As well might one contend against the generally received doctrine that marsh miasm possesses febrific qualities, and, pointing to the swamps and marshes, both fresh and salt, of New England, demand why these do not annually produce fever.

“In regard,” says Bancroft, “to the morbid effects supposed to result from the putrefaction of fish, they appear, so far at least as regards fever, to have had no existence.” This assertion I shall have occasion to notice hereafter, and refute by positive testimony to the contrary. That the boiling of blubber should be harmless notwithstanding its offensive effluvia, is what might certainly be expected, considering the great power of fire as before stated on several authorities to destroy malaria.

The use of fish for *manure*, as herrings, alewives, &c. is adverted to by Bancroft, and also by the gentlemen before alluded to in Boston and Philadelphia. It should be borne in mind, however, that these fish are most of them buried, and that such of them as are above ground, are strewed over it, and from their small size are soon dried;

they are not thrown in heaps in the manner that putrid coffee, potatoes, and cabbages, were, when *they* produced yellow fever, as appears from the several reports contained in the Medical Repository, and other publications. From those it seems that a sort of intestinal heat and fermentation in the centre of the mass is necessary to produce yellow fever. Now, the time required for this heat to generate in animal or vegetable substances from the evolution of new gases, is many days in the human body buried many months, and almost as many weeks above ground, whilst two or three days are sufficient to desiccate small fish strewed upon the ground, and prevent the fermentative process from taking place, although they may evolve disagreeable effluvia as stated to be the case by the Boston and Philadelphia writers, of those strewed upon the grounds near Newport, and on the banks of the Delaware.

Thus, I have examined nearly all the facts related by Bancroft, and the other gentlemen alluded to, and have shown that there were circumstances connected with each that weaken its force, and in almost every instance destroy it altogether, as a proof against the febrific power of animal decomposition.

One other substance remains to be noticed, to which these gentlemen attach much importance, as proving that animal decomposition is not febrific. It is human ordure. "Putrid human excrement," say they, "seems equally incapable of producing fever," and then they repeat the statements of night-men. But this substance, let it be borne in mind, if it proves any thing in the case, proves too much. Excrements are a part of the result of a process performed upon both vegetable and animal materials. If the fact were established that it did produce fever, and I were to offer it against the opinions of these gentlemen, they would turn upon me, and say that it is the vegetable part of the materials forming the excrement that causes the fever, for they all maintain, that putrid vegetables are febrific. But admitting, for the sake of the argument, that the excrement is the result of animal food alone, it is no longer the same animal matter as regards its susceptibility of febrific putrefaction. It has undergone the digestive process, has been imbued with, and acted upon, by the gastric juice, which we know has a strong influence upon the putrefactive process; it even corrects this, and in some animals subdues it to an astonishing degree, the most putrid meats being rendered perfectly sweet by it in their stomachs. Nor is it consistent with our views of the wisely ordered economy of nature, to suppose that man should, by an indispensable process of his system, be constantly producing a substance that could act as the bane of life.

The "atrocious smell" they advert to, as emanating from such

substances, is not, let it again be repeated, the cause of fever; besides, if it were the cause, this is as offensive in the form of flatus within the bowels, as when exhaled from the substance in a privy, and is in more immediate contact with the absorbents. In a word, human excrements possess the properties common to neither animal nor vegetable matter; it is a substance *sui generis*,* and its emanations cannot be fairly referred to, to support the doctrine that either animal or vegetable putrefaction possesses febrific properties.

The Boston and Philadelphia writers attach great importance to the exhumation of St. Innocens, as settling the question that animal decomposition never causes fever. In this they choose to “*go for the whole*,” whilst Bancroft, from whom they have copied this account of St. Innocens, and almost every other fact they advance, warily shields himself by a saving clause in his conclusion, which they have not seen fit to avail themselves of. The clause is this. “If putrefying animal matters are not completely harmless, they are at least innocent of the charge of producing *contagious fevers*.” Contagion was his subject of discussion, and he does not positively deny that fevers which are non-contagious, (and such he regards yellow fever,) can be produced by animal decomposition.

The Boston writer, with a spirit of candour that marks his whole paper, concludes it by saying, “Should a difference of opinion exist on any important point, I hope these remarks will have the effect to call it forth.” I therefore respectfully ask leave to dissent from his conclusion in one particular, even were the facts sound and incontrovertible from which he draws it. The case, (says he,) of the cemetery St. Innocens has been considered to be conclusive of the non-febrific nature of animal decomposition, if no positive and satisfactory facts can be adduced on the opposite side. Now, I maintain that this cemetery case, and all the other facts cited, amount to no more than negative evidence, and that unless the gentleman can show that they combine every circumstance that could favour the operation of animal putridity in causing fever, which would be next to impossible, the evidence amounts only to probability, and is not “*conclu-*

* In proof of this it may be observed, that where the whole food is exclusively vegetable, as is that of the ox kind, the emanations from the excrements are perfectly harmless. I challenge any one to adduce a well authenticated case of yellow fever caused exclusively by barn or stable manure, and yet nothing is more common than heaps of it round every farm yard throughout the middle and northern states, and under circumstances too of heat, moisture, and abundance of the mass, the most favourable for engendering malaria. Why then expect it from human excrements?

sive," even if no facts were adduced on the opposite side to prove that it does cause fever.*

One well established fact, however, proving beyond doubt that animal decomposition possesses febrific properties, is sufficient to controvert all the negative evidence to the contrary, which the gentlemen have adduced. It is now my purpose to offer many such facts.

1. The Rev. HENRY CHANNING in a letter to Dr. MITCHELL, see Medical Repository, Vol. II. p. 402, states it as his own opinion, and that of Dr. COIT, Dr. LEE, Mr. WOODMAN, and Mr. HOLT, that the yellow fever which prevailed in New London, in 1798, was caused by putrid fish. Of the whole number of cases of fever, (246,) "two hundred and thirty-one were clearly traced to the spot where the sickness commenced, that is, the persons were conversant, or had been in that part of the city a few days before they were seized," and "scarcely a single person escaped the disorder who resided in that part of the city.

"It appears," says Mr. C. "that there was a large quantity of dried fish, in a bad state, in four or five stores, within twenty or thirty rods of each other, and all in the limits referred to. These fish were taken in the Straits of Bellisle, which being a high northern latitude, they were cured with a much less quantity of salt than usual. They were brought to this port in the autumn of 1797. The heat of the summer having been very great, many of these fish were found to be in a moist, slimy state, early in August last. From a quantity lying in bulk, in a store occupied by Mr. Jones, (who fell a victim to the epidemic,) a quantity of green and yellow purulent matter ran upon the floor. It was thought by the owners, that if they were spread in the sun, in the open air, the fish might be preserved; which was done, extending them a considerable distance in the street and wharves. While thus exposed to the excessive heat of the sun, with light winds, the effluvia in the neighbourhood were very offensive."

Mr. Channing states that there was not even a shadow of ground to suppose that the disease was imported—and the situation of New London is elevated "with scarcely any low lands to generate marsh miasmata." The harbour is spacious, near the sea, from which refreshing breezes are experienced during the summer. The heat of the summer of 1798, it may be mentioned, exceeded both in intensity and duration, what had been known within the memory of the oldest inhabitants.†

* The Philadelphia writer expresses himself to the same effect as the Boston writer, in the following words. "It follows from the preceding series of facts, that animal putrefaction alone cannot be assigned as an epidemic cause, or scarcely indeed as a morbid agent."

† See also a second letter from Mr. Channing, Vol. II. p. 405.

2. Dr. SAMUEL OSBORN relates in the *Medical Repository*, Vol. I. p. 210, a case of yellow fever, caused by exposure to the exhalations of putrid beef. The patient, a soldier, was excused from duty on account of a violent and obstinate gonorrhœa; and a lodging was assigned him in a house without the garrison, on Governor's Island. In a few days, he was attacked with symptoms of yellow fever, and as his physician observed, in his visits, a very offensive smell in the house, he ordered the cellar under the patient's bed to be examined; where were found three barrels of beef in a state of extreme putrefaction. "So exceedingly offensive was the smell emitted from this mass of animal putrefaction, that the soldiers who were employed to remove it, were several times forced to desist, for the purpose of breathing fresh air, before they could accomplish their design." On the removal of the beef, the patient gradually mended.

3. Dr. COFFIN in a pamphlet on the danger of interments, states that—

"A man was killed by accident in Orange, New Hampshire. In about ten weeks after the burial, the body was taken up to be deposited in a different place. Twenty persons were present at the disinterment of the corpse, which was in a putrid state. Thirteen of these persons fell sick of fever not long after their exposure to the putrid gases from the dead body, and several of them died."

"There was no other assignable cause for this fever, than these noxious gases from the dead body, the season and the place being otherwise quite healthy."*

4. In Johnson's *Medico-Chirurgical Review*, Vol. II. N. S. p. 202, there is related an instance of fever of the putrid kind, and resembling plague, produced from a putrid human body.

"An American merchant ship was lying at anchor in Whampoa Roads, sixteen miles from Canton. One of her crew died of dysentery; he was taken on shore to be buried. No disease of any kind had occurred in the ship from her departure from America, till her arrival in the river Tigris. Four men accompanied the corpse, and two of them began to dig a grave, unfortunately, they lit upon a spot where a human body had been buried about two or three months previously, (as was afterwards ascertained.) The instant the spade went through the lid of the coffin, a most dreadful effluvium issued forth, and the two men fell down nearly lifeless.

"It was with the greatest difficulty their companions could approach near enough to drag them from the spot, and fill up the place with earth. The two men now recovered a little, and with assistance reached the boat, and returned on board. On the succeeding morning they were visited by an assistant-sur-

* I regret that the temperature of the weather is not given, though I have understood that it was hot.

geon from an English Indiaman in the roads, who reported the following symptoms, viz. very acute head-ache, with a sense of giddiness and dimness of sight, (which had existed more or less from the moment of opening the grave;) eyes of a peculiar muddy appearance, resembling that generally observed in cases of Indian cholera; oppression about the præcordia; dull heavy pain in the regions of the heart and liver, with slight palpitation at times, and fluttering pulse; sense of extreme debility, with occasional convulsive or spasmodic twitchings of the muscles of the lower extremities; nausea; slight diarrhœa; rigors, succeeded by flushings of the face, neck, breast, and upper extremities; tongue white, and much loaded; pulse from 110 to 120, weak and irregular; urine scanty and high-coloured; skin sometimes dry, sometimes covered with a clammy sweat. On the fourth day from the commencement of the attack, numerous petechiæ appeared over the breasts and arms; and in one of the patients a large bubo formed in the right groin, and another in the axilla of the same side, which speedily ran to suppuration. To one the disease proved fatal on the evening of the fourth day; to the other, on the morning of the fifth. For two days previously to death the gums bled freely. The symptoms were so completely similar in both the cases, that it is needless to repeat them here."

The post mortem appearances evinced a highly putrid state of the system.*

One of the two not immediately engaged in digging the grave, was attacked on the eighth day from his being on shore with "violent retching, and labouring under all the symptoms of the former patients in an aggravated degree. Was bled twenty-five ounces, and recovered."

5. Mr. SAMUEL RUSSEL, of New York, in a letter† to Dr. MITCHELL, states, that two hundred barrels of herring, in a considerably offensive condition, were shipped, in July, 1801, to St. Croix, and the market being bad, were taken to Kingston, Jamaica, where they were placed in store.

"By this time the fish were discovered to be fast spoiling, and advancing rapidly through the putrefactive process. The master of the store and his clerk lived and slept in a room directly above that in which the fish were now lying and corrupting. *They both were invaded by yellow fever.*"

6. The yellow fever which prevailed in Newburyport, in 1796, appears to have been caused by putrid fish.

"Respecting the origin of the disease," says Dr. Coffin, "there have been but two opinions. Some have supposed it was generated here; others, that it was imported from the West Indies in a vessel which arrived in May. The captain's account is, that about twelve days before his arrival here two of his men died on board of a putrid fever, after which he immediately cleansed the

* See Med. Chir. Rev. Vol. II. p. 203. † Med. Repos. Vol. V. 1822, p. 345.

vessel by washing it with vinegar, smoking it with tar, and scrubbing the cabin and steerage floors. He threw over the clothes which the sick had worn, and their bedding. Their other clothes were locked up in their chests, and afterwards sent home to their friends in a neighbouring town, without communicating any infection: the rest of the crew escaped the disease. Here it may be remarked, that if the vessel, on her arrival, had been stationed at some other part of the harbour, it would have been conspicuous, whether it brought the fever or not. But not far from the wharf at which it was unloaded, a great quantity of fish had been dressed for the West Indies, and the entrails left exposed to the air. The weather being uncommonly moist and warm, the exhalation was very offensive to the neighbourhood. In one of the houses nearest the fish offal, the three first persons were seized with the disease; and within twenty or thirty rods the greater number of its victims lived. The majority of those who recovered lived in other parts of the town. Most, if not all, who had it at a distance, had frequented the infected neighbourhood, but did not communicate the infection to their attendants. These are the principal facts from which the fever's origin must be determined.”*

7. “In the summer of the year 1783, M. Faure, a merchant of Narbonne, in Lower Languedoc in France, bought a house which had previously been occupied as an anatomical hall; and, being desirous of having a cave dug in the cellar, employed three men to do it. In digging, they came to the wall of a necessary, which had been the common receptacle of the remains of human subjects, and which was covered in to prevent detection; and, on extracting a few of the stones with their picks, an offensive, putrid matter rushed through the aperture, and suffocated them. M. Faure, going to see the workmen, descended but two or three steps before he fell senseless. The neighbouring people, perceiving the putrid smell, went to the house, and of nine that entered to bring out the sufferers, six died. M. Faure was removed, but died in four days; and the unfortunate labourers survived their release but a day or two.

“In the mean time, the smell increased to such a degree, as to create a pestilence, and the neighbours were obliged to remove; but a great many of them died. The Mayor of the city being informed of the circumstance, had the cellar filled up, and the house closed. But the malignant effluvia had pervaded the town, and a great many died of the *pestis*. The disease was attended with the black vomit, but not communicated by contagion.”†

8. In Washington, a small village, containing about four hundred inhabitants, situated six miles from Natchez, and occupying a high situation, remote from any swampy ground, the yellow fever prevailed in 1828, and was unquestionably occasioned by a quantity of putrid fish and hams lodged in a grocer's store. A minute and faithful history of the fever is given in the Medical Recorder for April, 1826, by a distinguished physician, Dr. S. A. Cartwright, on whose mind there appears to have existed not the shadow of a doubt that it was solely referrible to the above-mentioned cause. The great length of his paper prevents its insertion in this essay.

9. Dr. Caldwell, in his appendix to Alibert, p. 61, traces the yellow fever of one

* Med. Repos. Vol. I. p. 504.

† Med. Repos. Vol. IV. p. 245.

season in Philadelphia, to heaps of decaying oyster remains. The account is drawn out at too great length for insertion, but the proofs are satisfactory to my mind.

10. In Dieppe, a city in France, a pestilential disease was produced in 1776, by putrid oysters in the shell. Cited by the foregoing author from "observations on the epidemic diseases, and constitution of France."

11. "It appears, from a statement by Dr. Dick, published in the Medical Repository of New York, that the pestilential fever which prevailed in Alexandria, in 1803, originated from the septic exhalations thrown into the atmosphere by a large bed of putrid oyster-shells."

12. Dr. Rand, in his history of the yellow fever in Boston, relates the case of a person who was employed to remove some hides in a very putrid state, upon a point of land opposite Wheeler's wharf, and who sickened and died on the third day. This history of Dr. Rand describes the masses of animal matter in a putrid state on Fort-hill, Stoddard's wharf, &c. and the cases of the fever that originated from them.* "Three lads, apprentices to Mr. Manston the cooper, by repacking some of this beef, were seized with the fever and died."

Now, had the same number of persons been employed in moving the coffee on the wharf in Philadelphia, and all shared the same fate, is it likely that such a difference of opinion would have existed respecting the origin of the fever in that city in 1793?

13. A case is reported by Dr. Cogswell, of Hartford, of a man who was attacked with putrid fever, by passing a night in a boat containing barrels of putrid and highly offensive beef.†

14. "In 1748, at New York, a great quantity of salt beef, partly putrid, having been purchased by poor persons, took it to their chambers, and they were almost all victims of the yellow fever."‡

15. Ship General Green sailed from Newport to the West Indies, and a great part of her crew were attacked with malignant fever. She had on board putrid fish and beef, that was so offensive as to require being thrown overboard. Here I would observe, that, although the animal putrefaction was the most apparent cause, yet some may feel disposed to cavil, and attribute it to vegetable putrefaction in the vessel.

16. In the month of July, 17—, a very corpulent lady died at ——. Before her death she begged as a particular favour, to be buried in the parochial church. She had died on the Wednesday, and on the following Saturday was buried ac-

* Med. Repository, Vol. II. † See Webster on Plague and Pestilence.

‡ Dic. des Sciences Medicales, Vol. XXX. page 548; extracted from Valentin, p. 121 to 124.

cording to her desire. The weather at the time was very hot, and a great drought had prevailed. The succeeding Sunday, a week after the lady had been buried, the protestant clergyman had a very full congregation, upwards of nine hundred persons attending, that being the day for administering the holy sacrament.

It is the custom in Germany, that when people wish to receive the sacrament, they neither eat or drink until the ceremony is over. The clergyman consecrated the bread and wine, which is uncovered during the ceremony. There were about one hundred and eighty communicants. A quarter of an hour after the ceremony, before they had quitted the church, more than sixty of the communicants were taken ill: several died in the most violent agonies; others of a more vigorous constitution survived by the help of medical assistance; a most violent consternation prevailed among the whole congregation and throughout the town. It was concluded that the wine had been poisoned. The sacristy, and several others belonging to the vestry, were put in irons. The persons accused underwent very great hardships: during the space of a week they were confined in a dungeon, and some of them were put to the torture, but they persisted in their innocence.

On the Sunday following, the magistrate ordered that a chalice of wine uncovered should be placed, for the space of one hour, upon the altar; the hour had scarcely elapsed, when they beheld the wine filled with myriads of insects; by tracing whence they came, it was perceived, by the rays of the sun, that they issued from the grave of the lady who had been buried the preceding fortnight. The people not belonging to the vestry were dismissed, and four men were employed to open the vault and the coffin; in doing this, two of them dropped down and expired on the spot, the other two were only saved by the utmost exertions of medical talents. It is beyond the power of words to describe the horrid appearance of the corpse when the coffin was opened. The whole was an entire mass of putrefaction; and it was now clearly perceived that the numerous insects, together with the effluvia which had issued from the body, had caused the pestilential infection which was a week before attributed to poison. It is but justice to add, that on this discovery, the accused persons were liberated, and every atonement made by the magistrates and clergyman for their misguided conduct.*

17. "The sepulchral vaults of the principal church of Dijon, having been entirely filled, in consequence of the winter of 1773, which froze the ground of the common cemetery to such a depth that it could not be opened, orders were given to remove the bodies from these subterraneous repositories. Several attempts were made to purify the air by the detonation of nitre, by fumigations of vinegar, by burning a variety of perfumes, storax, benzoin, &c. &c. and by sprinkling the pavement with a large quantity of *anti-pestilential* vinegar, known by the name of *vinegar of the four thieves*. The odour of the putrid effluvia was merely masked for a moment by these operations, and soon re-appeared with its former activity, spreading to the neighbourhood, where the symptoms of a

* Gazette of Health, No. I. p. 2.

contagious fever began to appear. At this period I was consulted on the means of destroying the source of the distemper.”*

The above instances are sufficient in my mind to establish the fact that animal decomposition in particular stages of it, and under certain circumstances, will produce certain fevers, viz. the yellow and the putrid. Omitting further evidence in my possession, I shall now content myself with adverting in a few words to what seem to be necessary conditions to give activity to the process.

1. It must be in certain stages of the process, viz. the fermentative, as Burdach of Leipsic, before mentioned, terms it; that is to say, from two or three weeks to several months, varying no doubt according to circumstances of situation and state of the materials. The above instances confirm this opinion.

2. The heat must range at from not far below 80 to 100 degrees, if the materials are uncovered, though in a grave it must necessarily be less.

3. The mass must be large and moist.

4. I may remark that it seems to be immaterial whether the substance be free from salt, or imperfectly cured by it, though the evidence from the foregoing cases, and from those that are to be added in the appendix, rather goes to prove that a little salt hastens the process, and this accords with the effects of partially salted vegetables as salt marshes; and it is remarked by Webster and M. Brown, that fresh meat in water slightly salted, will corrupt sooner than in perfectly fresh water.

Let it be recollected as a matter of some weight, that the negative evidence of Dr. Bancroft and others, viz. the cemetery of St. Innocens, Dunkirk, &c. were adduced by a man who aimed at a victory over what are called contagionists, and in doing so, to establish by evidence the innoxious nature of animal putrefaction, in which he has endeavoured to make the most of the facts his industry could collect, and who has evidently perverted them, (in some particulars at least,) to suit his purpose; whilst the instances I have adduced as proof against him are from the pens of men who had no favourite hypothesis to establish, nor any motive to deviate from a plain statement of facts. There does appear then sufficient evidence for the conclusion, that yellow and putrid fevers do result from animal decomposition, though for reasons before stated, viz. scarcity of materials in the pro-

* Treatise on the Means of Purifying Infected Air, &c By L. B. Guyton de Morveau, p. 25.

per season of the year, and other necessary circumstances, they are comparatively of rare occurrence.

To the evidence drawn from cases, I will add the result of the experiments of Gaspard* and Majendie, made to show the effects of putrid animal and vegetable substances introduced into the veins. Supposing vapour to be the medium by which the febrific agent is evolved, how does it affect the system? It is first inhaled into the lungs; these, according to Majendie, expose a surface at each inspiration, "several times greater than that of the human body;" thus, admitted, it enters the blood, for odours are found by experiments to enter the circulation at a single inspiration. Now Gaspard proves that putrescent animal substances injected into the blood produce prostration of strength, dysentery, inflammation of the stomach and intestines. Water impregnated with vegetable putrefaction, produced similar though less violent symptoms. M. Majendie has also produced in the same manner diseases resembling those which result from vegetable malaria. He ascertained that infusions of different kinds of putrid animal substances were followed by different effects, "that water in which putrid fish had been soaked," (mark the coincidence with the cases I have cited of yellow fever produced by fish,) "produced when injected into the blood, symptoms resembling yellow fever."

III. *The comparative influence of both animal and vegetable decomposition as a cause of fever.*—I will not undertake to say what would be the proportion of cases of fever, if decomposing animal matter were as abundant in hot weather as vegetable matter is; nor will I say that it would then cause all the kinds of fever that I have shown in the first part of this essay do proceed from vegetable malaria. Perhaps it is the adynamic kind of fevers only, as malignant, yellow and putrid, that can be produced by it. If so, there would then be a vast disproportion in the number and kinds of fevers that result from the two causes. As it is, taking into consideration the disparity as regards quantity of the two kinds of matter actually existing in a state of decomposition, I think that the cases I have shown authorizes the inference, that the febrific effects of animal and of vegetable decomposition, so far as regards putrid and yellow fever, are about equal.

Providence, R. I. August, 1830.

* Gaspard, as given in page 24 to 37 of Vol. I No. I. Monthly Journal of Medicine.

